REMARKS

Claims 1-7, as amended, remain herein.

1. Claim 1 is amended further to include in the wherein clause the expression "the outer circumferential wall portion has been made of a crystalline cordierite." Support for this description of the outer circumferential wall portion is found in specification Paragraphs [0020] to [0022]. As further described in Paragraph [0023], the formation of the united crystalline outer portion can work as a member to give the compression effect (stress) as defined in claim 1.

2. Outline of this response. The rejections appear in the Office Action on pages 2-5. Thereafter, a "Response to Argument" section appears on pages 6-10, raising 10 issues applicant identifies as (A)-(J). The following Remarks address each rejection as a numbered paragraph. An indented section presents the respective (A)-(J) issues applying to that rejection beginning with a summary of the issue and finishing with applicant's reply.

3. Claims 1-7 were rejected under 35 U.S.C. 112, first paragraph, as allegedly containing unenabled subject matter. The rejection is traversed.

The Examiner contends the disclosure contains no description of how a slurry "is applied." Applicant explained in detail in the Amendment Under 37 C.F.R. §1.116 filed March 3, 2003 that there are two embodiments disclosed on how the slurry is applied. The following is from Section 7 of that document.

> In the present invention, on the other hand, the thermal expansion coefficient of the outer layer is increased by adding additional material to the outer periphery of the extruded honeycomb. This increase can be accomplished simply by applying additional material to the outer periphery of an already extruded honeycomb as illustrated in Fig. 1(b) copied below. Another way to achieve an increase is to grind off part of the outer region of an extruded honeycomb and then apply additional material to the remaining outer periphery as illustrated in Fig. 2(b) copied below.

FIG.1(b)

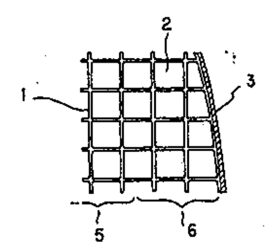
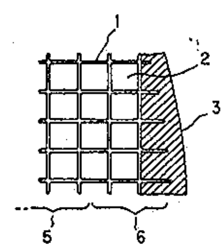


FIG.2(b)



> The first technique is described at page 12, line 16 to page 13, line 3, of the present specification; in that instance, the extruded thickness of the outer circumferential wall portion is 0.25 mm. The same raw material was then slurried and applied on the outer circumferential wall portion as shown in Figs. 1(a) and 1(b) to provide an outer wall thickness of about 1.25

mm. The data in Table 2 show the superior results obtained.

In addition to the technique discussed and quoted above, a second technique is described at page 19, line 1, to the end of page 20 of the specification. A grinder was used to grind down the outer diameter from 118 mm to 105 mm. The same raw material was then slurried and applied on the ground-down outer circumferential wall portion (see Figs. 2(a) and 2(b)) to provide an outer diameter of 106 mm. The pertinent data appears in Table 4 and Table 5 reports the superior results obtained.

Figs. 1 and 2 are also described in Paragraphs [0016] to [0019] on pages 6-8 of the specification.

Addressing the Examiner's initial question of how the slurry "is applied," applicant submits with great respect that an artisan in the coating art knows how to apply a slurry. Paint, for example, is a slurry of pigment in a liquid suspending vehicle. Coating artisans know how to apply paint to a surface. Applicant's description that the slurry is applied is sufficient without more to appraise the coating artisan how to apply the slurry to the normally cylindrical honeycomb outer surface to make the coating.

Response to Argument

A. Enablement- Section 112

The Examiner again asserts that applicant does not teach how the outer coating is applied.

In the discussion on pages 1-3 of the Request for Reconsideration filed July 18, 2003, applicant discussed the various ways disclosed in the specification in which to apply the outer coating.

The Examiner's attention is also directed to Kotani et al. '067 at col. 8, lines 20-30, disclosing various ways to apply the coating material to the outer periphery of the honeycomb body 14 as shown in Fig. 3.

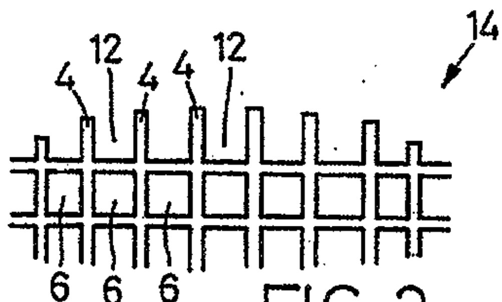


FIG. 3

These coating techniques are brush coating, dipping, spray coating, flow coating or slushing. This teaching shows that artisans know how to apply a coating to a honeycomb. The Examiner states at page 6 that applicant doesn't't teach how

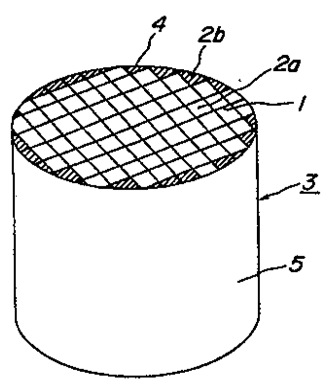
he coats the outer surface. However, applicant submits that the specification taken with the knowledge of the prior art teaches the artisan how to do so. Thus, the requirements of the first paragraph of 35 USC 112 are met.

According, review and withdrawal of this rejection are requested.

5. Claims 1, 2, and 6 were rejected under 35 USC 102(b) as anticipated by Machida et al. '446. This rejection is traversed.

Machida et al. '446 teaches eliminating the wasteful use of a catalyst by selectively sealing incomplete cells at an outermost peripheral portion of a honeycomb structural body with ceramic materials; see the Abstract.

FIG. 2



Machida et al. '446 provides no teaching or suggestion that the thermal expansion coefficient of the outer circumferential wall is to be greater than the coefficient of the inside partition

wall portion. Machida et al. '446 merely teaches the partial coating of selective incomplete cells inside the outer circumferential wall. Thus, the invention disclosed in Machida et al. '446 is not relevant to the present invention because a required stress can not be applied to the inside partition walls with the partial coating of selective cells inside the outer circumferential wall.

The Examiner's attention is directed to page 3 of the Declaration submitted July 18, 2003, where honeycombs made by the method of Machida et al. '446 are discussed. The TEC values appear in Table 1. The two sample values for the honeycomb are:

	Positioned determined	TEC	
Honeycomb body	Outer	Portion A 0.50, 0.52	Portion B 1.48, 1.52
	Intermediate	0.48, 0.51	
	Central	0.50, 0.55	
Catalyst	Outer	Portion A 1.12, 1.13	Portion B 1.84, 1.97
	Intermediate	1.13, 1.15	
	Central	1.12, 1.17	

Here Portion A is the complete cell that is not being sealed and Portion B is the incomplete cell that is being sealed with the ceramic material.

As discussed by Declarant (see the top of page 6), the thermal expansion coefficients of the products produced by Machida et al. '446 showed in principle no practical difference among the outer circumferential wall portion, the intermediate portion, and the central portion, except the B Portion. As to this exception, the Declarant states that no practical stress could be expected because the portions having higher thermal expansion coefficient in the outer circumferential wall portion were discontinued at the B portions, similar to a discontinued link. In this last sentence the word "not" should be deleted as is clear from the context; "not" was unnecessary because it was preceded by "no." In view of the failure of any practical stress to be exerted on the inner portion of the honeycomb, the Machida et al. '446 honeycomb does not meet the requirements of claim 1. Accordingly, review and withdrawal of this rejection is requested.

Claims 2 and 6 further define preferred features of the resulting ceramic honeycomb structure and are patentable for the same reasons that claim 1 is patentable.

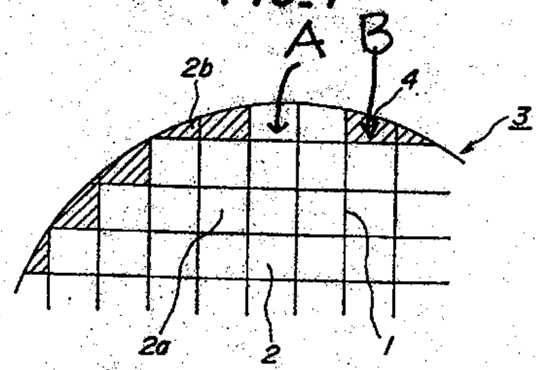
Response to Argument

C. Declaration - Examiner contends Machida has a TEC differential

The Examiner contends Machida inherently makes a honeycomb having the same TEC differential as

applicant's product. The Declaration submitted July 18, 2003, as discussed above, presents evidence to the contrary. The Declaration defines two areas Portion A and Portion B in the outer portion of the honeycomb as marked up below.

FIG. 1



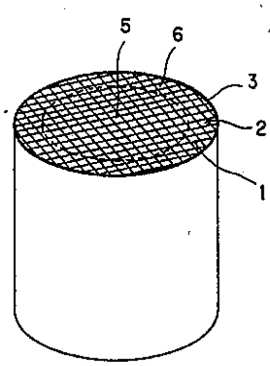
Portion B is the filled-in partial cell labeled as 4 in Fig. 1 and Portion A is the two open cells to the left of cell labeled 4; those open cells have no filling. The TEC values for Portion A are basically the same; there is no larger TEC for the outer wall than for the inside portion as recited in claim 1. See this discussion in the full paragraph on page 9 of the Request for Reconsideration filed July 18, 2003. There applicants notes that the discontinuous nature of the outer A and B portions means there is no practical stress being generated.

D. <u>Declaration does not define inside and outside walls</u>

The Examiner criticizes the Declaration for "not clearly set[ting] forth what the outside or inside walls are." However, the key terminology in describing the present invention is the "outer circumferential wall <u>portion</u>" and the "inside partition wall <u>portion</u>" because the thermal expansion coefficient (TCE) is to be measured in these two portions.

Fig. 1(a) illustrates the generic configuration.

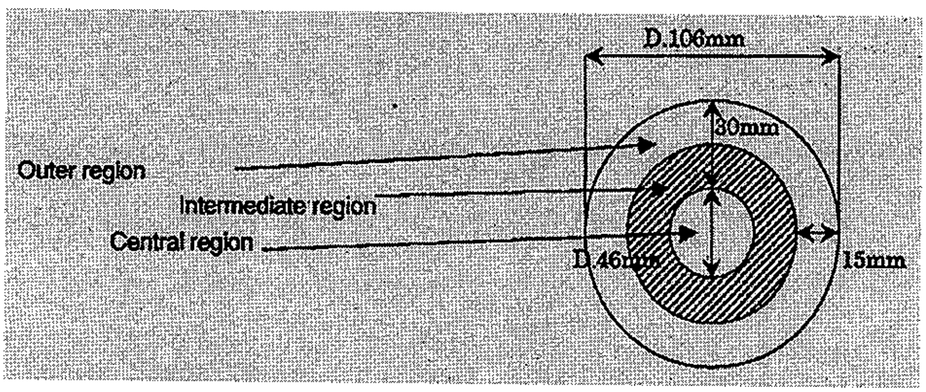
FIG.1(a)



where through holes (cells) 2 are surrounded by partition walls 1. The outer circumferential wall portion is 3 and the inside wall portion is 5. It is the TCE in these two portions that are to be compared.

E. <u>The Declaration - the "intermediate region" is not defined</u>

The Examiner questions what is meant by the intermediate region. The term appearing in the Declaration is "intermediate portion"; the two other terms used in the Declaration are "outer portion" and "central portion." These are relative terms. However, to answer the Examiner's question, consider the case of a honeycomb with a diameter of 106 mm illustrated below.



The outer portion (or region) is that portion (or region) from the outer periphery to the portion located at the distance of about 15 mm from the periphery. The intermediate portion (or region) is located at the position of 15 mm to 30 mm distance from the periphery, and the central portion is located at the position of 30 mm distance from the periphery to the center.

The effect or role of the intermediate portion (or region) is to transfer the compression power formed due to the difference in TEC from the outer walls to the central walls.

F. What is the catalyst relation to the body?

The Examiner asks whether the catalyst is on the outside. The answer is no. The catalyst would be loaded on the inner surface of the walls by using well-established techniques. The exhaust gas is then purified during its passage through the channels 2 in Fig. 1(a) defined by the walls 1 on the surface where the catalyst is loaded. The artisan does not place catalyst on the outside of the honeycomb because the exhaust gas is traveling only through the inside channels.

Accordingly, review and withdrawal of this rejection are requested.

6. Claim 1 was rejected under 35 USC 102(b) as anticipated by EP 0798 042 to Kumazawa et al. or its U.S. equivalent U.S. 5,846,899. This rejection is traversed.

Claim 1 is amended to recite that the outer circumferential wall portion has been made of a crystalline cordierite. Kumazawa

et al. only coats with γ-alumina and thus the reference does not teach the presently claimed product.

Applicant further submits that all Kumazawa et al. teaches is merely immersion coating a normally-extruded honeycomb extruded body with a washcoat under two special conditions. First, the washcoat contains γ-alumina with a thermal expansion coefficient larger than the thermal expansion coefficient of the honeycomb structural body. Second, a volume shrink is generated when a high temperature is provided after application of the washcoat. See page 4, lines 12-18 of the reference:

> In the present invention, in order to decrease a thermal expansion coefficient of the ceramic honeycomb catalyst comprising the ceramic honeycomb structural body and the carrier coated on a surface of the ceramic honeycomb structural body, two features of γ-alumina i.e. (1) thermal expansion coefficient being larger than that of the honeycomb structural body and (2) a volume shrink being generated on a high temperature are utilized.
>
> That is to say, if the carrier coated on the ceramic honeycomb structural body is subjected to a heat treatment at a high temperature, a volume shrinkage occurs, and the generated shrinkage functions as a compressive stress with respect to the ceramic honeycomb structural body.

There is no discussion in the reference of applying the special alumina material on <u>only</u> the outside of the honeycomb extruded body.

The Examiner's attention is directed to page 2 of the enclosed Declaration where Mr. Ikeshima describes honeycombs made

by the method of Kumazawa et al. The TEC values are given in Table 1. The two sample values for the honeycomb are:

	Positioned determined	
Honeycomb Body	Outer	0.49, 0.54
	Intermediate	0.50, 0.51
	Central	0.50, 0.53
Catalyst	Outer	1.09, 1.20
	Intermediate	1.11, 1.15
	Central	1.13, 1.13

As pointed out at the top of page 6 of the Declaration, the thermal expansion coefficients of the products produced by Kumazawa et al. showed in principle no practical difference among the outer circumferential wall portion, the intermediate portion, and the central portion.

In conclusion, Kumazawa et al. '899 (or its European counterpart) does not teach applying the wash coating material to the outside of the honeycomb body. Indeed, Kumazawa et al. '899 is silent regarding the thermal expansion coefficient difference between the inside partition wall portion and the outer circumferential wall portion. The experimental data presented in the Declaration demonstrate that there is no significant TEC differential. Accordingly, Kumazawa et al. '899 provides no motivation to obtain nor suggestion of obtaining applicant's

result where stress is applied to the inside partition wall portions from the outer circumferential wall portion.

Response to Argument

I. Kumazawa et al. and how does one know γ-alumina is not on the outside of the honeycomb?

This question is moot because claim 1 is amended to specify that the outer circumferential wall portion has been made of a crystalline cordierite. The mere coating by Kumazawa et al. with γ-alumina provides no possibility of forming united crystalline cordierite as an outer wall portion even by subjecting it to firing. The desired TEC can only be attained when one follows the description on Paragraphs [0020] to [0023] of the present specification.

J. Examiner questions whether the higher TEC is due to firing or coating

The Examiner raises the following question in the first two lines of page 8 of the Office Action: "Would the firing [of] the body result in the TEC being higher or only the application of the γ-alumina make the TEC higher?" This question appears to relate to Kumazawa

et al. As indicated above in Section I, the coating by Kumazawa et al. with merely γ-alumina provides no possibility of forming united crystalline cordierite as an outer wall portion even by subjecting that cordierite to firing. The desired TEC can only be attained when one follows the description on Paragraphs [0020] to [0023] of the present specification.

Accordingly, review and withdrawal of this rejection are requested.

7. Claims 1 and 2 were rejected under 35 USC 103(a) as unpatentable over Kotani et al. '067 in view of Kumazawa et al. '899. This rejection is traversed.

The Examiner is referred to Section 6 above where the deficiencies of Kumazawa et al. '899 are discussed. First, claim 1 is amended to specify that the outer circumferential wall portion has been made of a crystalline cordierite. Kumazawa et al. only coats with γ-alumina and thus does not teach the presently claimed product. Second, the Declaration demonstrates the Kumazawa et al. product is not a honeycomb having a TEC differential from the outside to the inside.

Kotani et al. '067 discloses a three-step process to make a honeycomb as described in Example 1 in cols. 8-10. In a first

step, a honeycomb is made within outer wall; see Figs. 1 and 2. The outer wall is ground away in a second step, and the absence of that wall can be seen in Fig. 3 copied below.

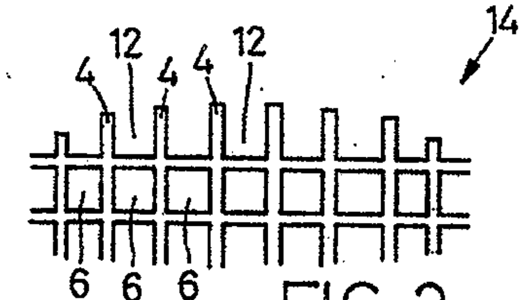


FIG.3

To permit grinding of the outer wall, the honeycomb first must have been fired to give to the partition walls 4 the structural rigidity needed to withstand the grinding process.

Finally, in a third step, additional cordierite material 16 is applied to make the thicker outer wall as seen in Fig. 4, copied below.

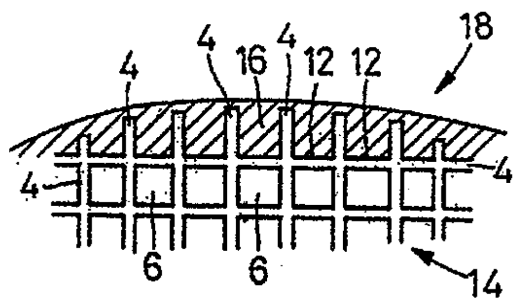


FIG.4

The deficiencies in combining these two references are discussed in Section 8 of the Amendment Under 37 C.F.R. §1.116 filed March 3, 2003.

The Examiner's attention is directed to page 2 of the Declaration for a discussion of the honeycombs made by the method of Kotani et al. '067. The TEC values appear in Table 1. The two sample values for the honeycomb are:

	Positioned determined	TEC
Honeycomb body	Outer	1.55, 1.63
	Intermediate	0.50, 0.52
	Central	0.49, 0.53
Catalyst	Outer	1.85, 1.93
	Intermediate	1.10, 1.15
	Central	1.14, 1.17

As discussed by Declarant (see the second and third paragraphs on page 6):

> In case of the present invention and Kotani, there was observed a big difference in the thermal expansion coefficient between the central portion and the circumferential wall portion.
>
> However, the declarant has realized that the stress can be given from the outer circumferential wall portion to the central portion only in the case that the shrinkage due to the temperature change of the product itself after firing occurs. Thus, in the case of the honeycomb structures obtained according to the method disclosed by Kotani, there is no room of giving substantial stress to the inner portion from the outer circumferential wall portion since the inner portion

has been fired and become hard before the outer circumferential wall portion is coated after removing the distorted cells in the outer peripheral portions.

In other words, when the outer coating is applied in Kotani et al. '067 and fired, no additional stress will occur on the already fired inner portion of the honeycomb. Thus Kotani et al. '067 will not be applying stress to the inside partition wall portion from the outer wall portion as is required in the honeycomb structure in claim 1. Accordingly, review and withdrawal of this rejection are requested.

Response to Argument

B. Difference in structure between Present Invention and Kotani et al. '067

The Examiner contends Kotani et al. '067 and applicant have the same structure. The outer coating for the Kotani et al. '067 article should be amorphous because the article contains a matrix of amorphous oxide such as colloidal silica and colloidal alumina as recited in patent claim 1, for example. It is quite evident that this type of the material does not become crystalline even when subjecting it to firing after coating.

On the other hand, the present outer

circumferential wall portion should be made of a crystalline cordierite, as can be easily seen from the description on Paragraphs [0020] to [0022] of the present specification. Claim 1 has been amended to specify "the outer circumferential wall portion having been made of a crystalline cordierite." This formation of the united crystalline portion works as a member giving the compression effect (stress), as is discussed on Paragraph [0023] of the present specification. Such a structure is not taught by Kotani et al. '067.

Accordingly, review and withdrawal of this rejection are requested.

8. Claims 4 and 5 were rejected under 35 USC 103(a) as unpatentable over Machida et al. '446 in view of Kotani et al. '067. This rejection is traversed.

These claims depend from claim 1, which has been amended to specify that the outer circumferential wall portion has been made of a crystalline cordierite.

As discussed previously, Machida et al. '446 provides no teaching or suggestion that the thermal expansion coefficient, when measured in the diameter direction, of the outer

circumferential wall is to be greater than the coefficient of the inside partition wall portion.

As discussed previously also, Kotani et al. '067 fails to teach or suggest applying stress to the inside partition wall portion from the outer wall portion as is required in the honeycomb structure in claim 1. Accordingly, there can be no proper combination of these two references to render obvious the subject matter of claims 4 and 5, which depend from claim 1. The Declaration establishes also why the claims are patentable over these references. Review and reconsideration of this rejection are requested.

9. Claims 3-5 were rejected under 35 USC 103(a) as unpatentable over Machida et al. '446 in view of Kotani et al. '067 and further in view of Beauseigneur et al. '722. This rejection is traversed as well.

The deficiencies of Machida et al. '446 and Kotani et al. '067 in combination to suggest the claimed honeycomb structure are discussed above in Section 8.

Beauseigneur et al. '722 is cited for disclosing several examples of honeycomb structures having a range of the numbers of cells per unit area values and typical wall thickness requirements as recited in instant claims 3-5. However, because Beauseigneur et al. '722 provides no teaching or suggestion that the thermal

expansion coefficient, when measured in the diameter direction, of the outer circumferential wall is to be greater than the coefficient of the inside partition wall portion, Beauseigneur et al. '722 cannot overcome the deficiencies of the two primary references. Accordingly, there can be no proper combination of these three references to deny patentability to claims 3-5.

It appears claim 7 is also rejected over these three references; see Section 14 [indicated as 4] of the Office Action which follows the rejection of claims 3-5 in Section 13. However, because claim 7 depends from claim 1, claim 7 is also patentable because the three references fail to teach the basic honeycomb structure of claim 1. The rejection should be withdrawn.

Applicant respectfully submits that the application is now in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for all pending claims.

Should the Examiner deem that any further action by applicant would be desirable for placing this application in even better condition for issue, the Examiner is requested to telephone applicant's attorney at the number listed below.

Respectfully submitted,

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December 31, 2003
Date

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